SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Computer Game Design and Programming

CS 134

Fall 2025 In Person 3 Unit(s) 08/20/2025 to 12/08/2025 Modified 08/19/2025

Contact Information

Instructor: Kevin M. Smith
Office Location: DH282 (enter door on second floor near elevators)
Email: kevin.smith@sjsu.edu
Office Hours: Mondays 12:30-1:30 (DH282 – In Person Only)
Class Days/Time: MW 10:30-11:45
Classroom: Clark Building 324
Prerequisite: CS 146 and either CS 151 or CMPE 135 (with a grade of "C-" or better in each); or instructor consent. C++ experience recommended, but not required)

Course Overview
In this course, you will learn the critical elements in the design and implementation of a computer games from the ground up. This will include some of core components required to implement a modern high performance game engine. The course will initially focus on 2D games and then we will extend our knowledge to include 3D. You will implement required functionality in your own game engine to support navigation, animation, physics, audio and user-input through designing and building an actual game. We will augment our knowledge with case studies of existing games and current commercially available game engines.

The description below is the catalog description.

Course Description and Requisites

Architectures and object-oriented patterns for computer game design. Animation, simulation, user interfaces, graphics, and intelligent behaviors. Team projects using an existing game engine framework.

Prerequisite: CS 146 and either CS 151 or CMPE 135 (with a grade of "C-" or better in each); Allowed Majors:
Computer Science, Applied and Computational Math, Software Engineering or instructor consent.

Letter Graded

Classroom Protocols

Laptops are permitted in class only for use only with CS134 Class Materials and Labs.

Cellphones are not permitted to be used in class unless for SJSU system authentication.

Class attendance is required for all classes. Please be on time. The professor is usually 10 minutes early and we start the class on time. If you must come late or are required to leave during the lecture, please enter at rear of classroom and use the seats in back to cause as little disruption to the class as possible.

No eating is allowed in class.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students will be able to:
1: Describe how modern video games (2D and 3D) are designed and implemented.
2: Design and create a game from scratch in C++ (using a C++ graphics).
3: Learn several techniques and design patterns used to develop high-performance game engines.
4: Develop a physics-based animation system for player motion and visual effects
5: Gain an understanding of the current state-of-the art in game technology through use-cases

Course Materials

Textbook
There is no textbook required for the class.

Software and Computer
Students will be required to have access to a modern capable laptop or desktop computer running recent version of Windows or macOS. In addition to a computer, a three-button mouse is required for the programming assignments. The development projects for this class will be done in C++. Students will be required to download and install a development framework for their particular operating system including Visual Studio (Windows) or Xcode (macOS) and a C++ graphics development library (instructions will be provided on first day of class).

Software Packages
Students are required to use the following software packages for this course:
1. Visual Studio (Latest Version) Free Community Version (PC) or Xcode (MAC)
2. Video Capture Software
3. Autodesk Maya (for creating your own 3D content) (free student version available)
4. Open Frameworks (Latest Version) C++ Library (Open Source)
5. Adobe Photoshop or Equivalent for editing 2D game assets such as sprites.

Course Requirements and Assignments

1. Development Projects (35%)
Students will complete several major 2D and 3D game development projects involving the use of C++ and the production tools covered in the class. The projects will be specified on Canvas.

2. Labs/Homework (30%)
There will be a series of labs and homework projects. Some of the labs are designed to be completed in class.

3. Engagement (5%)
Students will be required to participate in class discussions and present their work in informal presentations.

4. Final Project (30%)
The student project will be comprehensive 3D game prototype that will leverage concepts learned and components from pervious assignments.

Final Project

There is no final exam. The student will be required to submit a final game project which demonstrates comprehensive knowledge learned in the class. This will include a recorded trailer demonstrating all features, a prototype game culminating in a final presentation.

Gallery

A Google Gallery will be provided for the course where students will be required post a movie of their assignments (or still images, depending on the assignment) in a web Gallery.

Engagement

Students are expected to fully participate in class sessions (in-person or online) by asking questions and contributing to class discussions. There will be opportunities for students to present homework solutions and/or projects in the classroom (in addition to the final project, which has a required presentation) and should be prepared to present at least one time during the semester.

Home, Projects and the use of AI-assisted Development
For homework and project solutions, only algorithms and mathematical methods covered in class will be accepted. Students must implement their solutions using the tools specified in the assignment. ChatGPT or AI-based programming assistance can be used as a reference to look up functions or find examples (which often contain errors), but the student is required to develop their own unique solution to the problem. Any submitted work that doesn't meet these requirements will not be accepted and the student will not receive credit for the assignment.

Grading Information

Criteria

The grading criteria for development projects is based on:

1) completion of required functionality

2) robustness of required functionality

3) quality of deliverables which includes quality of code and any required documentation or assets included with the project.

Breakdown

94% or above A

90% A-

87% B+

83% B

80% B-

77%. C+

73% C

70% C-

67%. D+

63% D

60% D-

< 60% F

Note: there is no "rounding" of grades to letter grades. For example, if your final grade in Canvas is 93.9%, you will receive an A-.

Late Work Policy

Homework and labs will not be accepted late after the deadline. Projects will be accepted late with a 10% reduction in grade per day late up to a maximum of three days. After three days, it will not be accepted.

University Policies

Per University Policy S16-9 (PDF) (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Week 1 (8/21)	- Introduction and Development Environment, Game Engine Dev Vector Math Review
Week 2 (8/25)	- Vector Math Review Basic 2D Vintage Arcade Game Project
Week 3 (9/1)	- Basic 2D game interactivity - Rendering/Drawing and Input and Animation
Week 4 (9/8)	- Basic 2D Game Animation
Week 5 (9/15)	- Design Patterns for Sprites and Emitters
Week 6 (9/21)	- Simple Collision Detection for 2D Games, Basic Physics 101

Week 7 (9/29) - Game Physics and Simulation
Week 8 (10/6) - Build Your Own Particle System with Forces
Week 9 (10/13) - Putting it all together (midterm 2D game project due 10/15)
Week 10 (10/20) - 3D Graphics Introduction
Week 11 (10/27) - 3D Game Cameras, Viewing and Selection
Week 12 (11/3) - Spatial Partitioning and Collision Optimization
Week 13 (11/10) - Lighting and Subdivision Surface Modeling Basics (for Games)
Week 14 (11/17) - 3D Shaders Programming and Shadow Mapping (if time is available)
Week 15 (11/24) - 3D Character Modeling and Rigging - Final Project Check-in

Week 16 (12/1) -Final Project Presentations

12/10 – Final Projects Due

* There is no final exam for CS134. The culminating event is the Final Project and your presentation.

- Note: some course topics may change or be modified.